Further Information on the Giant Gippsland Earthworm *Megascolides australis* (McCoy 1878)

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Abstract

The Giant Gippsland Earthworm, *Megascolides australis* McCoy, 1878, is one of the world's largest earthworms and is restricted to a small area in South Gippsland. It is listed by the International Union for the Conservation of Nature as "vulnerable". Despite its fame, very little is known about its basic biology, and there is some incorrect information about the worm in the literature and in the media. Some of this incorrect information is reviewed.

Introduction

The Giant Gippsland Earthworm is one of the largest species of earthworm in the world (Stephenson 1930) and is restricted to a small area in the Bass River Valley of South Gippsland. Since its description in 1878, the Giant Gippsland Earthworm has become one of Victoria's famous endemic animals and occupies a place in local South Gippsland folk-lore, as evidenced by the "Karmai" or Giant Gippsland Earthworm festival held annually in Korrumburra. Smith and Peterson (1982) summarize most of the available information about *M. australis*, and we are providing supplementary information.

Discovery of the Giant Gippsland Earthworm

The worm was first discovered in the Brandy Creek (Warragul) area, and described as *Megascolides australis* (McCoy 1878). Fletcher (1887) erroneously named the species *Notoscolex gippslandicus*, but McCoy's name takes precedence.

Despite the publicity generated since its discovery, scientific information about the worm is scant. The available information is largely confined to anatomy (Bage 1909; McCoy 1878; Spencer 1888a,b; Vejdovsky 1892), taxonomy (Jamieson 1971a,b), or physiology (Weber and Baldwin 1985). Much of the information on the worm's biology and ecology remains in the form of anecdotal information. In the numerous articles written about *M. australis* much information has simply been repeated or reproduced from the original papers of McCoy (1878) and Spencer (1888b). Amongst this literature are some erroneous observations and assumptions about the worm that have been accepted without scientific verification.

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Size

Size alone has made *M. australis* famous; the question of how an invertebrate of such size and weight has adapted to its environment has largely been neglected except for studies on its respiration (Weber and Baldwin 1985). The length of earthworms varies considerably because of their ability to expand and contract. A contracted worm can more than double its length when relaxed. Dead worms, or living worms held vertically, elongate and this has led to exaggerated estimates of length.

Worms of 3.3 to 3.6 m in length have been reported (Barrett 1929, 1931, 1938; Quick 1963). From the authors' experience, the average size appears to be approximately 1 m in length and 2 cm in diameter. Weight would seem to be a more accurate measure of size since it would not vary with the worm's ability to expand or contract.

Different species of giant earthworms have also been recorded in Sri Lanka, North America, South America, northern New South Wales, southern Queensland, and South Africa. A South African worm,

Microchaetus sp., is usually 30-150 cm in length, but an unsubstantiated newspaper report describes a worm attaining 7 m in length and 75 mm in diameter (Ljungstöm and Reinecke 1969). However, Lee (1985) suggests that a worm of this size would weigh 30 kg and could not move without bursting its skin because of the internal hydostatic pressures that would be required to move so large a mass.

Odour

A peculiar odour resembling that of creosote has been associated with the worm in the past (Barrett 1938; McCoy 1878). We have never encountered this odour and Quick (1963) suggests that the worms may have become contaminated with creosote from new sleepers used for the railway being built at the time.

Gurgling sounds

A distinguishing characteristic of the worm is the gurgling sound it makes as it retreats down its tunnel, a sound aptly compared to water draining out of a bath. The worms emit a milky coelomic fluid from their dorsal pores when disturbed. This fluid also apparently lubricates the worm's tunnel to aid movement and this, combined with the water in the tunnels, probably contributes to the gurgling sound.

Biology

Very little is known about the biology of the worm, and what is known originates mainly from the work of McCoy and Spencer. We still do not know how long the worms live. However, we have been able to differentiate three sizes (presumably age classes) of worms on the basis of the appearance of the clitellum: young worms (11-33 g), subadult worms (40-78 g), and adults (125-260 g) (all weights are fresh weight including soil).

Reproduction

Although the anatomy of the reproductive organs is fairly well documented by Spencer (1888b), the reproductive process is unknown. The worm is hermaphroditic, but parthenogenesis has not been demonstrated in this species, so two individuals are apparently needed for fertilization to take place. The sexual organs are contained within the clitellum which extends from segments 13 to 21 and it is this region that ultimately produces the egg capsule, the mucus for copulation and the milky fluid contained in the capsule.

Egg capsules

The egg capsules laid by *M. australis* are 4-7 cm long x 1-1.5 cm wide. Spencer (1888b) and Quick (1963) state that the capsules contain a single embryo worm surrounded by a milky fluid, but one report claims that the worm lays two eggs in a capsule and normally only one egg reaches maturity (Anonymous 1980). Stewart (1946) reports that only one capsule is laid by a worm in one year and that capsules are always found singly.

Capsules are generally found within the upper 30-40 cm of soil, but have also been reported lying among grass rootlets or free in the soil (Barrett 1938; Quick 1963). Our observations indicate that capsules are found down to a depth of 40 cm in a blind-ended tunnel that comes off another tunnel. The capsules range in weigh from 7.6-12.6 g, with an average of about 9 g.

The incubation period of the worm is unknown but Smith and Peterson (1982) thought that it is about 4 months. However, our observations suggest that it is at least 12 months. Freshly laid capsules are seen in early winter after the soil becomes cool and moist and worms hatch in winter or early spring when the ground is wet. We have found capsules over most of the year, and hatching occurs from August through to January. Emerging worms are reported to be 10-18 cm in length (Smith and Peterson 1982), though we have found them up to 28 cm in length upon hatching.

The capsule splits about a week before the young worm emerges, and the worm can take from one day to a week to completely free itself from the capsule.

Surfacing

Whether or not the worms ever actually come to the surface is disputed. While Stewart (1946) reports that the worms never actually come to the surface and suggests that this is the reason for their limited distribution, because they cannot migrate, others go as far as to claim that the worms often rest with about a foot of their head end out in the open in autumn and winter (Barrett 1938; Quick 1963; Smith and Peterson 1982). Other reports suggest sudden showers may bring the worm to the surface due to the flooding of their tunnels (Smith and Peterson 1982). It is most unlikely that worms do surface completely because they have difficulty moving when they are completely removed from their tunnels.

It is known that worms are found close to the surface in winter when the ground is wet, while during the summer they retreat to greater depths (Barrett 1938). Not much is known about the structure of worm tunnels, however they are thought to be permanent and can go down quite a long way.

We have found that young worms are generally slightly closer to the surface, followed by subadult worms, and adults are found deeper (at an average depth of 47 cm).

Diet and casts

The diet of the worm is unknown but Eve (1974) suggested live roots and organic matter in the soil. We have found root hairs, root particles, grass blades, leaves of dicotyledonous plants, seeds, and organic and mineral matter in the casts.

Very little is known about the cast material of *M. australis,* except that it is deposited below ground, unlike many other earthworms, particularly lumbricids, which are surface casters. The casts back fill some of the tunnels, and it is unknown if the worms eat the casts when they move through the tunnels or leave them blocked. Some casts are older as evidenced by plant roots growing through them and following them through the tunnel. The mounds surrounding the entrances to yabbie burrows were mistaken as Giant Gippsland Earthworm casts by McCoy (1878). It appears that generally the worms are found in areas where yabbies of the genus *Engaeus* are present.

Regeneration

Some far-fetched descriptions of the regenerative capacities of *M. australis* have been made, including an incident where a worm was reportedly cut into nearly a dozen pieces and each section developed into a complete worm (Barrett 1931). Both McCoy (1878) and Fletcher (1887) reported that the worms were very fragile, and that decomposition set in quickly when they were damaged. It is unlikely that the adult worm can regenerate when cut. From our experience, we have found some worms that have wounds that have healed, but the majority of even slightly damaged worms have remained alive for only a short period. They usually shrivel up and begin decomposing within a few hours while the worm is still alive.

Distribution

Prior to the advent of European settlement, the hills of South Gippsland supported dense thick sclerophyll forest composed of large Blue Gums *(Eucalyptus globulus* Labill.), Blackwood *(Acacia melanoxylon* R.Br.), paperbark blackbutt and treeferns (South Gippsland Pioneers' Association 1966). It was also described as a jungle of miscellaneous trees, shrubs and grasses with giant eucalypts that grew close together and reached a height of 300 feet and as much as 10 feet in diameter (Holland 1929).

Human penetration of this region was limited and spasmodic until the mid 1870s (Hartnell 1974). However, as the clearings extended and drew nearer to one another, most of the wildlife was destroyed.

Extensive ploughing had been undertaken by the 1930s, and the land was sown to permanent pasture and used for dairy production. No evidence of the original forest remains except a few remnant Blue Gums scattered sparsely over the landscape or gathered along the banks of streams and in gullies.

The Giant Gippsland Earthworm has survived despite the destruction of the original vegetation and the inevitable changes in soil moisture and temperature that this must have brought about. However, the total effects of this change on the worm numbers and distribution will never be known. Have worm numbers declined? Has the range contracted? It is also probable that the worm's food source has changed with the disappearance of what must have been an extensive plant litter and humus layer. Has this been replaced by pasture grasses (roots, green tissue or rotting tissue) or cattle dung?

The conservation status of *M. australis* remains controversial. It is listed by the International Union for Conversation of Nature as vulnerable (Wells *et al.* 1983). However, opinion is divided as to whether the worm populations are declining. Some claim the abundance and distribution of the worm have declined since the land was first opened up 50 to 60 years ago due to factors such as ploughing and the addition of superphosphate (Anonymous 1980; Quick 1963). It is possible that the worms are not as apparent today because of the reduced amount of earthworks being undertaken compared to when the land was being settled. Others stress that the worm is as abundant as ever although possibly only in small areas (B. Green, personal communication 1987).

A questionnaire study on the distribution of *M. australis* was conducted by Smith and Peterson (1982). They concluded that it is found in deep blue-grey clay soil along creek banks, near soaks and springs, on river flats or on south or west-facing slopes of hills in 100,000 hectares of the Bass River Valley roughly bounded by Loch, Korrumburra and Warragul.

Megascolides australis is found locally in large numbers and can be extremely abundant in very small areas. However its distribution is very patchy and it is not known whether worm numbers are declining or whether its range is contracting. The centre of distribution may be as small as 5,000 hectares. There are a few unconfirmed reports of worms found outside this area, but only one has been confirmed. We recently found *M. australis* in the Mt. Worth State Park.

Although our distributional studies are still incomplete, our findings suggest that the worm is usually restricted to the banks and surrounds of water courses, soaks, underground springs and gullies, and very few have been found on river flats away from water sources.

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